

ASSESSMENT OF PLANT BIODIVERSITY IN WECHIAU COMMUNITY HIPPOPOTAMUS SANCTUARY IN GHANA

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ABSTRACT

A study was conducted in the Wechiau Community Hippopotamus Sanctuary in Ghana in order to assess the plant biodiversity found in the sanctuary. The study was conducted over a period of three years (2000–2003) through botanical inventories and using sample plots. A total number of 227 species of plants belonging to 72 families were identified and three vegetations types: Riverine forest, Floodplain and Upland flora were found in the sanctuary. Many of the species of plants were Mesophanerophytes and Thereophytes whereas a paucity of the species was Heleophytes, Hydrophytes, Hemicryptophytes and Chamaephytes. The results of the study are discussed and recommendations made for further research to support the conservation and sustainable use of plants in the sanctuary.

KEY WORDS: Plant biodiversity, Wechiau, Hippopotamus, Ghana, conservation

RESUMEN

Se realizó un estudio en el Wechiau Community Hippopotamus Sanctuary en Ghana para valorar la biodiversidad vegetal presente en el santuario in. El estudio se realizó durante un periodo de tres años (2000–2003) mediante inventarios botánicos y usando parcelas de muestreo. Se identificaron un total de 227 especies de plantas pertenecientes a 72 familias y tres tipos de vegetación: bosque de rivera, llanuras de inundación y tierras altas en el santuario. Muchas de las especies de plantas fueron mesofanerófitos y terófitos mientras que las especies minoritarios fueron helófitos, hidrófitos, hemicriptófitos y caméfitos. Se discuten los resultados del estudio y se hacen recomendaciones para investigaciones posteriores con vistas a la conservación y el uso sostenible de las plantas en el santuario.

INTRODUCTION

The Wechiau Community Hippopotamus Sanctuary is a community-based initiative in the Upper West Region of Ghana to protect the remaining unprotected hippopotamus (*Hippopotamus amphibius*) population in the Black Volta River, which would help to develop the ecotourism potential for the area. The other population of hippopotamus in Ghana is found in the Bui National Park, which is about 56 km from the present sanctuary. This population of hippopotamus in the park is under threat with the government's plan to develop a dam for hydro-electrical power generation. It is anticipated that the present population of hippopotamus in the Bui National Park will migrate to the sanctuary when the dam is finally developed.

The chiefs and people of Wechiau traditional area with technical assistance from a local non-governmental organization, Nature Conservation and Research Centre (NCRC) have decided to conserve the populations of hippopotamus and other biological resources in their area. They also hope to generate income through the promotion of ecotourism focused to improve the livelihood of the rural communities. The sanctuary is one of the two examples in Ghana where the local people are taking full control of the management of their biological resources through a Sanctuary Management Board (SMB). There is however no baseline information on the plant biodiversity in the sanctuary that will assist in making management decisions for the conservation and sustainable use of the plant resources in the sanctuary.

The present study was therefore conducted in order to assess the plant biodiversity in the Wechiau Community Hippopotamus Sanctuary in Ghana.

MATERIALS AND METHODS

Study area

The study was conducted at Wechiau about 40 km southwest of Wa in the Upper West Region of Ghana. The study area is positioned between latitudes 02°41'N and 02°49'N and between longitudes 09°43'W and

09°53'W. The area has been demarcated and conserved as Wechiau Community Hippopotamus Sanctuary and occupies an area of about 40 Km² along the banks of the Black Volta River. The vegetation of the sanctuary is primarily Guinea savanna (Oteng-Yeboah & Asase 2002) and the terrain is mostly flat.

METHODS

The plant biodiversity in the sanctuary was assessed through botanical inventories and using sample plots over a period of three years (2000-2003). Botanical inventories entailed walking through different areas of the vegetation of the sanctuary while picking and identifying plants with identification aids. Each species of plant identified was monitored for its life form (*sensu* Raunkiaer 1934) throughout the period of the study. The botanical inventories were conducted through twelve field visits to the sanctuary and voucher specimens of the species of plants encountered were collected and have been deposited at the Ghana Herbarium (GC) at the Department of Botany, University of Ghana. The preliminary field identifications of the plants were checked using the *Flora of West Tropical Africa* (Hutchison & Dalziel 1954–1972) and by comparison with identified specimens at the GC herbarium.

In order to determine the species richness in the sanctuary, sample plots measuring 25 m × 25 m, 5 m × 5 m and 1 m × 1 m were randomly demarcated in the sanctuary. Forty-one of each plot size was studied. The 25 m × 25 m plot was used to study trees and 5 m × 5 m used to assess small trees and shrubs whereas the 1 m × 1 m plots was used to study the ground flora (herbaceous and grass species). The species richness was evaluated from the average number of species count for all the plots examined for each plot size.

RESULTS

Species richness and composition

A total of 227 species of plants belonging to 71 families were identified in the sanctuary. The mean numbers of species of trees was 7.62 in 5.3 families from the 25 m × 25 m plots and that of small trees and shrubs was 3.33 species in 2.62 families from the 5 m × 5 m plots while that of ground flora species was 4.10 species in 3.92 families from the 1 m × 1 m plots.

Many of the plant species in the sanctuary (85.5%) belong to the dicotyledonous group (Appendix 1). The monocot group contributed 14.1% of the species and only one species of Pteridophyte (*Ophioglossum costatum*) was identified from the sanctuary (Appendix 2 and 3). Within the dicotyledonous group, the family Papilionaceae contributed the largest number of genera (9.2%) and species (8.2%). The other dicotyledonous families that contributed many species and genera to the flora of the sanctuary were Rubiaceae, Asteraceae, Euphorbiaceae, Caesalpinaceae, Mimosaceae, Verbanaceae, and Combretaceae.

The monocotyledonous group contained many genera and species of the families Poaceae, Liliaceae, Cyperaceae, Araceae, and Commelinaceae. However, the families Hypoxidaceae, Orchidaceae, and Zingiberaceae contributed only one genus and species each to the flora of the sanctuary.

Vegetation types and species composition

The vegetation of the sanctuary changes gradually from Riverine forest vegetation through Floodplain vegetation to Upland flora vegetation as one moves inland from the Black Volta River. The three vegetation types found in the sanctuary were largely based on their physiognomy and species composition.

Upland flora vegetation.—The appearance and species composition of this vegetation type is similar to the general characteristics of the Guinea Savanna vegetation. The species diversity is very high in this vegetation type compared to that of the other two vegetation types with species of trees from the families Sapotaceae (*Vitellaria paradoxa*), Mimosaceae (*Entada africana*, *Parkia biglobosa*), Caesalpinaceae (*Azelia africana*, *Daniellia oliveri* and *Tamarindus indica*), Anacardiaceae (*Haematostaphis barteri*, *Lannea acida* and *Lannea kerstingii*), Bombacaceae (*Adansonia digitata*, *Bombax costatum*), Meliaceae (*Khaya senegalensis* and *Pseudocedrela kostchyi*), Simaroubaceae (*Hannoa undulata*), Papilionaceae (*Pterocarpus erinaceus*) and Combretaceae (*Terminalia avicennoides* and *Terminalia* species).

Smaller trees and shrubs were from the families Euphorbiaceae (*Bridelia ferruginea*), Cochlospermaceae

(*Coclospermum planchonii* and *C. tinctorium*), Combretaceae (*Combretum ghasalense*, *Combretum molle* and *Combretum* spp.), Celastraceae (*Maytenus senegalensis*), Chrysobalanaceae (*Parinari curatetfolia* and *Parinari polyandra*), Olacaceae (*Ximenia americana*), Caesalpinaceae (*Piliostigma thonningi* and *Swatzia madagasgarensis*) and Polygalaceae (*Securidaca longepedunculata*).

The herbaceous flora also included species from the families Liliaceae s.l, but currently in Asparagaceae (*Asparagus flagellaris*), Hypoxidaceae (*Curculigo pilosa*), Euphorbiaceae (*Sapium grahamii*, *Euphorbia бага*, *Euphorbia ladermanniana*) and Zingiberaceae (*Kaempferia aethiopica*). Grass species were mainly *Andropogon gayanus*, *Hyparhennia subplumosa*, *Hyperthelia* spp., and *Ctenium newtonii*.

In areas where the vegetation has previously been intensively farmed, *Vitellaria paradoxa* and *Parkia biglobosa* were the main trees found and the herbaceous species consisted of ruderal plants from the families Asteraceae (*Ageratum conyzoides*, *Emilia* sp., *Tridax procumbens*), Rubiaceae (*Mitracarpus scaber*, *Borreria radiata*) and Euphorbiaceae (*Euphorbia hirta*, *Euphorbia heterophylla*).

Floodplain vegetation.—This vegetation was found next to the Upland flora vegetation towards the Black Volta River. The vegetation area is often flooded during the rainy season and the ground becomes patchy in the dry season. Trees and climbers were few but with a very dense grass cover in the rainy season. The main tree species were from the families Rubiaceae (*Mitragyna inermis*) and Mimosaceae (*Acacia nilotica* and *Acacia gourmaensis*). Other species of trees were from the families Balanitaceae (*Balanities aegyptiaca*), Rhamnaceae (*Ziziphus mauritianum*), Rubiaceae (*Crossopteryx febrifuga*), Combretaceae (*Terminalia macroptera*), Anacardiaceae (*Lannea acida* and *L. kerstingii*), Papilionaceae (*Pterocarpus erinaceus*) and Meliaceae (*Pseudocedrela kotschyi*).

The ground flora was predominated by members of the family Poaceae (including *Vetiveria fulvibarvis*, *Andropogon gayanus*, *Brachiaria jubata*, and *Hyparhennia subplumosa*). Herbaceous species of the families Mimosaceae (*Cassia mimosoides*), Papilionaceae (*Crotalaria goorensis* and *Tephrosia platycarpa*), Amaryllidaceae (*Crinum humile*) Polygonaceae (*Polygonum senegalensis*), Commelinaceae (*Aneilema* sp., *Floscopa africana*, and *Murdannia simplex*), and Spencleaceae (*Sphenoclea zeylanica*) were also common.

Riverine forest vegetation.—This vegetation type was found on either side of the Black Volta River. The vegetation was very dense as a result of large number of climbers and relatively tall trees that formed a canopy. Species of tree from the families such as Sterculiaceae (*Cola laurifolia*), Papilionaceae (*Pterocarpus santalinoides*), and Bignoniaceae (*Kigelia africana*) that are found along permanent rivers were common. Other common trees were from Combretaceae (*Anogeissus leiocarpus*), Ulmaceae (*Celtis integrifolia*), Bombacaceae (*Ceiba pentandra*), and Ebenaceae (*Diospyros mespiliformis*).

Among the smaller trees and shrubs were members of the families: Caesalpinaceae (*Cassia sieberiana*), Papilionaceae (*Milletia zechiana*), Mimosaceae (*Endata abyssinica*), Flacourtiaceae (*Cassipourea congoensis*, *Dissomeria crenata*), Rutaceae (*Afraegle paniculata*), and Verbanaceae (*Vitex chrysocarpa*).

Climbers and herbaceous species were mainly from Sapindaceae (*Paullinia pinnata*), Passifloraceae (*Passiflora* sp.), Colchicaceae (*Gloriosa superba*), Annonaceae (*Monanthes taxis* sp.), Capparidaceae (*Capparis erythrocarpus*), Araceae (*Achomanes welwitschii*), Liliaceae s.l, but strictly in the family Anthericaceae (*Chlorophytum pusillum*), and Papilionaceae (*Aeschynomene afraspera*).

Life forms and species composition

The 227 plants identified in the sanctuary belong to 9 life-forms categories (Table 1). Many of the species of plants in the sanctuary were Mesophanerophytes and Thereophytes with few species of Heleophytes, Hydrophytes and Hemicryptophytes in the sanctuary. Many of the species of Thereophytes in the sanctuary were members of the families Rubiaceae, Asteraceae and Euphorbiaceae. Also the Mesophanerophyte and Microphanerophyte were made up of species from Caesalpinaceae, Meliaceae, Anacardiaceae and Mimosaceae. The Chamaephytes made up of species from the families Annonaceae, Aristolochiaceae and Cochlospermaceae whereas the species of Nanophanerophytes were from members of Sapindaceae and Verbenaceae. Geophytes were commonly members of the Amaryllidaceae and Commelinaceae.

TABLE 1. Life form composition of species of plants in Wechiau Community Hippopotamus Sanctuary in Ghana.

Life-form	Total number of species contributed	Contribution of life form to the flora of the sanctuary (%)
Thereophyte herb (ThH)	60	27.75
Thereophyte climbing herb (ThI)	3	
Chamaephyte herb (ChH)	5	7.05
Chamaephyte climbing herb (ChHI)	6	
Chamaephyte shrub (ChS)	5	
Hydrophyte herb (HyH)	3	1.32
Helophyte herb (HeH)	1	0.045
Geophyte herb (GrH)	26	11.45
Hemicryptohyte (Hcr)	8	3.52
Mesophanerophyte tree (MPT)	17	28.21
Mesophanerophyte shrub (MPS)	36	
Microphanerophyte shrub (mpS)	15	8.37
Microphanerophyte epiphyte (mpE)	2	
Microphanerophyte liana (mpWI)	2	
Nanophanerophyte shrub (NpS)	21	11.89
Nanophanerophyte liana (NpWI)	6	

DISCUSSION

The present study is the first attempt to compile an authoritative checklist of the plant biodiversity in the Wechiau Community Hippopotamus Sanctuary and the study has shown that the composition of plant species in the sanctuary is similar to that of Guinea savanna vegetation (Hopkins 1974; Lawson 1985). The species richness and diversity in their life-forms of the plants in the sanctuary was also similar to Guinea savanna vegetation studied by Oteng-Yeboah (1996)

Bushfires impact on plant biodiversity and therefore it is important for the Sanctuary Management Board to make strategic management plans that will protect core areas of the sanctuary from bushfires and other human activities such as farming. With the exception of few species of plants such as *Afraegle paniculata* (Schum. & Thonn.) Engl., *Commiphora dalzielii* Hutch. and *Ceiba pentandra* (L.) Gaertn, many of the species of plants identified in the sanctuary were generally very common. The Sanctuary Management Board could initiate species specific management programs such as the collection of seeds and other propagules of these uncommon species of plants for their subsequent cultivation in the sanctuary.

It is hoped that this information on the plant biodiversity in the sanctuary will serve as a baseline data for making management decisions for the conservation of the sanctuary resources and promotion of ecotourism activities in the area. It is however recommended that further research should investigate the quantitative abundance and distribution of the species of plants as well as the indigenous uses of the plants in sanctuary.

APPENDIX

Checklist of dicotyledonous plants in Wechiau Community Hippopotamus Sanctuary in Ghana. See Table 1 for definition of life-form.

Amaranthaceae

Celosia trigyna L.; ThH

Pandiaka involucreta (Moq.) B.D. Jackson; ThH

Anacardiaceae

Haematostaphis barteri Hook.f.; MPT

Ozoroa insignis Delile; MpS

Lannea acida A. Rich.; MPT

Lannea kerstingii Engl. & K. Krause; MPT

Spondias mombin L.; MPS

Annonaceae

Annona glauca Schumach. & Thonn.; ChS

Annona senegalensis Pers.; ChS

Hexalobus monopetalus Engl. & Diels.; NpWI

Apocynaceae

Saba senegalensis (A. DC.) Pichon; mPWl
Strophanthus hispidus DC.; NpS

Aristolochiaceae

Aristolochia albida Duch.; ChHl

Asclepiadaceae

Calotropis procera (Aiton) W.T. Aiton; npS
Pachycarpus lineolatus (Decne) Bullock; npS

Asteraceae

Acanthospermum hispidum DC.; ThH
Ageratum conyzoides L.; ThH
Aspilia africana (Pers.) C.D. Adams; ThH
Blumea aurita DC.; ThH
Echinops longifolia A. Rich.; GrH
Gomphrena celosoides Mart.; ThH
Synedrella nodiflora Gaertn.; ThH
Tridax procumbens L.; ThH
Vernonia amygdalina Delile; npS
Vernonia perrottetii Sch.Bip. ex Walp.; ThH
Vernonia purpurea Sch.Bip. ex Walp.; ThH
Vicoa leptoclada (Webb) Dandy; ThH

Balanitaceae

Balanites aegyptiacus Delile; MPS

Bignoniaceae

Kigelia africana (Lam.) Benth.; MPT
Stereospermum kunthianum Cham.; MPS

Bombacaceae

Adansonia digitata L.; MPT
Bombax costatum Pellegr. & Vuillet; MPT
Ceiba pentandra (L.) Gaertn.; MPT

Boraginaceae

Heliotropium indicum L.; ThH

Burseraceae

Commiphora dalzielii Hutch.; mpS

Caesalpinaceae

Burkea africana Hook.; MPS
Cassia absus L.; ThH
Cassia mimmosoides L.; ThH
Cassia sieberiana DC.; MPS
Cassia tora L.; ThH
Dalium guineensis Willd.; MPS
Daniellia oliveria (Rolfe) Hutch. & Dalz.; MPT
Detarium microcarpum Guill. & Perr.; MPS
Isobertina doka Craib & Stapf; MPT
Piliostigma thonningii (Schumach.) Delile-Redh.; mpS

Caesalpinaceae

Tamarindus indica L.; MPT
Senna occidentalis (L.) Link.; ThH

Capparaceae

Cleome viscosa L.; ThH
Cadaba farinosa Forssk.; ThH
Capparis erythrocarpos Isert; NpWl
Ritchiea reflexa Gilg & Benedict; NpWl

Celastraceae

Hippocratea africana Loes. ex Engl.; ThH
Maytenus senegalensis (Lam.) Exell.; npS

Chrysobalanaceae

Parinari curatellifolia Planch. ex Benth.; mpS
Parinari polyandra Benth.; mpS

Cochlospermaceae

Cochlospermum planchonii Hook. f.; ChS
Cochlospermum tinctorum A. Rich.; ChH

Combretaceae

Anogessius leiocarpus Guill. & Perr.; MPT
Combretum aculeatum Vent.; mpS
Combretum ghaselense Engl. & Diels.; mpS
Combretum hypopilinum Diels.; mpS
Combretum molle L. Br. ex G. Don.; mpS
Combretum nigricans Leprieur ex Guill. & Perr.; mpS
Combretum paniculatum Vent.; NpWl
Combretum sericeum G. Don.; ChH
Pteleopsis suberosa Engl. & Diel.; mpS
Quisqualis indica L.; MPS
Terminalia avicenoides Guill. & Perr.; mpS
Terminalia laxiflora Engl.; MPS
Terminalia macroptera Guill. & Perr.; mPT

Convolvulaceae

Evolvulus alsinoides L.; npS
Ipomoea sp.; NpWl

Cucurbitaceae

Zehneria halli Hook. f.; ThHl

Ebenaceae

Diospyros mespiliformis Hochst. ex A. DC.; MPT

Euphorbiaceae

Bridellia ferruginea Benth.; MPS
Euphorbia бага A. Chev.; ThH
Euphorbia convolvuloides Hochst ex Benth.; ThH
Euphorbia ladermaniana Pax & K. Hoffin.; ThH
Euphorbia macrophylla Pax.; ThH
Euphorbia poissonii Pax.; npS
Euphorbia sp.; npS
Hymenocardia acida Tul.; MPS
Jatropha curcas L.; npS
Jatropha gossypifolia L.; npS
Phyllanthus amarus Schum & Thonn.; ThH
Sapium grahami Prain.; ThH
Securinega virosa (Willd) Baill.; ChS
Tragia vogelii Keay.; ThH

Flacourtiaceae

Oncoba spinosa Forssk.; MPS

Lamiaceae

Ocimum canum Sims; ThH

Loganiaceae

Strychnos innocua Delile; MPS
Strychnos spinosa Lam.; MPS

Loranthaceae

Tapinanthus dodoneifolius (DC.) Danser.; mpE
Tapinanthus bangwensis (Eng. & Krause) Danser.; mpE

Malvaceae

Hibiscus asper Hook.f.; ThH
Sida alba L.; ThH
Sida sp.; ThH

Meliaceae

Khaya senegalensis A. Juss.; MPT
Pseudocedrela kotschy Harms.; mpT
Trichilia emetica Vahl; mpS

Menispermaceae

Cissampelos mucronata A. Rich.; ChH

Mimosaceae

Acacia gourmaensis A. Chev.; MPS
Acacia hockii De Wild.; mpS
Acacia nilotica L. (Delile); MPS
Acacia sp.; npS
Azelia africana Sm.; MPT
Dicrostachys glomerata Chiov.; mpS
Entada abyssinica Steud.; mpS
Entada africana Guill. & Perr.; mpS
Mimosa pigra L.; ThH
Parkia biglobosa (Jacq.) R. Br. ex G. Don; MPT
Propolis africana Taub.; MPT

Moraceae

Ficus abutilifolia (Miq) Miq.; MPS
Ficus capensis Thunb.; MPS
Ficus platyphylla Del.; MPS

Moringaceae

Moringa oleifera Lam.; MPS

Myrtaceae

Eugenia subherbacea A. Chev.; ThH

Nyctaginaceae

Boerhavia diffusa L.; ThH

Olacaceae

Boerhavia diffusa L.; ThH

Opiliaceae

Opilia celtidifolia (Guill. & Perr.) Endl. ex Walp.; mpWI

Papilionaceae

Abrus precatorius L.; ThH
Aeschynomene afraspera J. Leonard.; ThH
Alysicarpus ovalifolius J. Leonard.; ThH
Canavalia sp.; ThH
Crotalaria goreensis Guill. & Perr.; ThH
Erythrina senegalensis DC.; mpS
Lonchocarpus laxiflorus Guill. & Perr.; MPS
Lonchocarpus sericeus (Poir) H.B.K.; npS
Millettia zechiana Harms; npS
Ostryoderris stuhlmannii (Taub.) Dunn ex Harms; MPS
Pericopsis laxiflora (Benth. ex Baker) Meeuwen; MPS
Pterocarpus erinaceus Poir.; MPT
Pterocarpus santalinoides L'H'er ex DC.; MPT
Swarztia madagascarensis Desv.; MPS

Tephrosia platycarpa Guill. & Perr.; ThH
Uraria picta (Jacq) DC.; ThH

Passifloraceae

Passiflora foetida L.; ThH

Pedaliaceae

Sesamum alatum Thonn.; ThH
Sesamum indicum L.; ThH

Polygalaceae

Securidaca longepedunculata Fresen.; MPS

Polyonoaceae

Polygonum senegalensis Meisn.; Hy

Portulacaceae

Talinum trigulare (Jacq.) Willd.; ThH

Rhamnaceae

Ziziphus mauritiana Lam.; ChS

Rhizophoraceae

Cassipourea congoensis R. Br ex DC.; MPS

Rubiaceae

Borreria radiata DC.; ThH
Borreria scaber (Schum & Thonn.) K. Schum.; ThH
Chassalia sp.; mpS
Chrysanthellum americanum Rich.; ThH
Crossopteryx febrifuga (Afzel. ex G. Don) Benth.; MPT
Fadogia agrestis Schweinf. ex Heirn.; npS
Feretia apodanthera Del.; ThH
Gardenia ternifolia Schum. & Thonn.; npS
Mitracarpus scaber Zucc.; ThH
Mitragyna inermis (Willd). O. Ktze.; mPT
Nauclea latifolia Sm.; mpS
Oldelandia corymbosa L.; ThH
Polysphaeria arbuscula K. Schum.; npS

Rutaceae

Afraegle paniculata Engl.; mPT
Zanthoxylum xanthoxyloides (Lam.) Waterman.; nPS

Samydaceae

Dissomeria crenata Hook. f. ex Benth.; MPS

Sapindaceae

Allophyllus africanus P. Beauv.; NpWI
Blighia sapida König; MPT
Cardiospermum grandiflorum SW.; ThH
Paullinia pinnata L.; NpWI

Sapotaceae

Malacantha alnifolia Pierre; MPT
Vitellaria paradoxa C.F. Gaertn. f.; MPT

Scrophulariaceae

Striga hermonthica Benth.; ThH
Striga linearifolia (Schumach. & Thonn.) Hepper.; ThH

Simaroubaceae

Hannoa undulata Planch.; MPT

Solanaceae

Datura metel L.; ThH

Sphenocleaceae*Sphenoclea zeylsnica* Gaertn.; Hy**Sterculiaceae***Cola laurifolia* Mast.; MPT*Sterculia setigeria* Delile; MPS*Waltheria indica* A. L. ; ChH**Taccaceae***Tacca leontopetaloides* (L.) Kuntze.; GrH**Tiliaceae***Corchorus olitorius* L.; ThH*Grewia carpinifolia* Juss.; MpS*Grewia cissooides* Hutch. & Dalziel; ChH*Grewia mollis* Juss.; MpS**Ulmaceae***Celtis integrifolia* Lam.; MPT*Trema orientalis* Blume.; NpS**Verbenaceae***Clerodendron capitatum* Schum. & Thonn.; NpS*Lantana trifolia* L.; ThH*Lippia multiflora* Moldenke; ChH*Stachtarpheta indica* L.; ThH*Vitex chrysophylla* Planch.; NpS*Vitex doniana* Sweet; MPS**Vitaceae***Cissus flavicans* Planch.; ChHI*Cissus populnea* Guill. & Perr.; ChHI

APPENDIX

Checklist of monotylenous in Wechiau Community Hippopotamus Sanctuary in Ghana. See Table 1 for definition of life-form.

Amaryllidaceae*Crinum humile* A. Chev.; GrH**Araceae***Haemanthus rupestris* Baker; GrH*Amorphophallus dracontoides* N.E. Br.; GrH*Anchomanes welwitchii* Rendle; GrH*Stylochiton lancifolium* Kotschy & Peyr.; GrH**Commelinaceae***Aneilema setiferum* A. Chev.; GrH*Floscopa africana* C.B. Clarke; Cl.; GrH*Murdannia simplex* (Vahl) Brenan; GrH**Cyperaceae***Cyperus ambilis* Vahl; GrH*Fimbristylis* sp.; Hcr*Kyllinga* sp.; GrH*Mariscus foliosus* C.B. Clarke; GrH**Hypoxidaceae***Curculigo pilosa* (Schum. & Thonn.) Engl.; GrH**Liliaceae** s.l. **Aloaceae***Aloe buettneri* A. Berger; GrH**Asparagaceae***Asparagus flagellaris* Baker; ChHI**Anthericaceae***Chlorophytum pusillum* Schweinf. ex Baker; GrH**Hyacinthaceae***Scilla picta* A. Chev. ex Hutch & Dalziel.; GrH**Orchidaceae***Eulophia cristata* Lindl.; GrH**Poaceae***Andropogon gayanus* Kunth; Hcr*Brachiaria lata* (Schumach.)C.H. Hubb.; Hcr*Brachiaria* sp.; Hcr*Ctenium villosum* Berhaut.; GrH*Cymbopogon giganteus* Chiov.; Hcr*Cynodon dactylon* (L.) Pers.; Hcr*Dactyloctenium aegyptium* Willd.; GrH*Digitaria* sp.; GrH*Hyperrhenia* sp.; Hcr*Hypethelia* sp.; Hcr*Panicum maximum* Jacq.; GrH*Saccharum spontaneum* L.; HyH*Setaria* sp.; GrH**Zingiberaceae***Kaempferia aethiopica* Solms ex Engl.; GrH

Pteridophyte species in Wechiau Community Hippopotamus Sanctuary in Ghana. See Table 1 for definition of life-form.

Ophioglossaceae*Ophioglossum costatum* R. Br.; GrH

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